

Name _____
Date _____

Teacher _____
Section _____

Geometry Unit 18: Euclidean vs Non-Euclidean Geometry 2009-2010

Instructions: Select the best response for each multiple choice item.

For those items that are not multiple choice, show all work and/or justify your response.



1.

Which of the following is the major premise that separates Euclidean geometry from other non-Euclidean geometries?

- A. A circle can be drawn with any given point as the center and any given radius.
- B. Parallel lines can be drawn given any point and a line as long as the point is not on the line.
- C. Distance can be measured by a formula.
- D. A straight line can be drawn through any two points.

2.

In hyperbolic geometry, a theorem exists which states that no two triangles are ever similar, except in the case where they are also congruent. Which is a reasonable conclusion about figures in hyperbolic geometry?

- A. All figures are congruent.
- B. Two figures can have the same shape and be different sizes.
- C. Two figures can be the same size and be different shapes.
- D. Two figures can have the same size only if they are the same shape.

3.

In spherical geometry, two points do not necessarily determine a line, as is the case in Euclidean geometry. Which best explains the reason why this is true?

- A. There are no lines on the surface of a sphere.
- B. Points on a circle do not lie in the same plane.
- C. On a sphere, two points can lie on an infinite number of great circles.
- D. Lines in spherical geometry can only be formed when great circles intersect each other.

4.

The curved surface of the earth compares to which undefined term in Euclidean geometry?

- A. plane
- B. line
- C. point
- D. space

5.

Which of the following is the correct term to describe the curves that minimize the distance between points on a sphere?

- A. Antipodal
- B. Geodesics
- C. Lune
- D. Biangle

6.

A sphere with a diameter of 18 cm is sliced through the epicenter by a plane. Which best describes the resulting cross section?

- A. a semi circle
- B. a round circle
- C. a great circle
- D. a non-circle

7.

Since the surface of the earth is a sphere instead of a plane, the shortest distance between 2 points would take the form of (a/an) _____.

8.

Classify each of the following statements as true (T) or false (F). Each statement pertains to spherical geometry concepts:

_____ a. Any two distinct points determine exactly one line.

_____ b. A spherical triangle can have two right angles.

_____ c. Three distinct lines form at most one triangle.

_____ d. Given a line and a point not on a line, there exists no line that passes through the point and is parallel to the line.

_____ e. A line segment can intersect another line segment in exactly two points.

9.

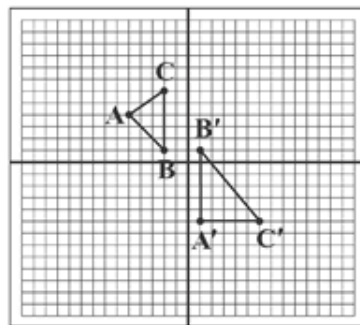
Describe the set of points equidistant from a given point in Taxicab space. How is this different from that of an Euclidean space?

10.

In spherical geometry, what is the name for points formed by the two points of intersection when the line passes through the center of the sphere? Give an example.

11.

Examine the graph and figures below in the context of taxicab geometry (geometry as measured along streets in a grid).



Explain whether $\triangle ABC \cong \triangle A'B'C'$ using Side-Angle-Side in taxicab geometry.

12.

Describe how the angle measures of a triangle may differ on the surface of a sphere, or globe, verses on the lateral surface of a cylinder.

Answer Key

#	Item ID	Key	TEKS	Stimulus
1	MG1098192D	B	G.1C	-
2	MG1098194D	D	G.1C	-
3	MG1098196D	C	G.1C	-
4	MG1098198D	A	G.1C	-
5	MG1098208D	B	G.1C	-
6	MG1095153D	C	G.1C	-
7	MG1098200D	an arc	G.1C	-
8	MG1098202D	a. F b. T c. F d. T e. T	G.1C	-
9	MG1098204D	The set of points is a square in taxicab space, but in an Euclidean space, the set of points is a circle.	G.1C	-
10	MG1098206D	Antipodal; North and South Poles of the earth	G.1C	-
11	M0G00015RX	See attached Rubric or Checklist	G.1C	-
12	M0G00014RX	See attached Rubric or Checklist	G.1C	-

Checklist List**11)**

Sample Answer:

Using the 2 triangles in taxicab geometry:

$\overline{AB} \cong \overline{A'B'}$, each has a distance in taxicab of 6 units

$\overline{AC} \cong \overline{A'C'}$, each has a distance in taxicab of 5 units

$\angle BAC \approx \angle B'A'C'$, since the triangles are not both isosceles

$\triangle ABC \approx \triangle A'B'C'$ under SAS

12)

Sample Answer:

The lateral surface of a cylinder, when unfolded as a net, is a rectangle. The angles of a triangle sum to 180 on the surface of a plane in Euclidean geometry. When a triangle is drawn on the surface of a sphere, the sphere does not unfold to form a plane (rectangle). The curved surface distorts the properties as they appear on a plane and parallel lines do not exist as we know them on a plane. When the angles of a triangle on a sphere are measured, the sum is always greater than 180 degrees.

Rubric List**11)**

3	The response shows full understanding of the essential mathematics applicable to the task and a sound approach toward solution that includes logical reasoning and appropriate conclusions. Computation and procedures used are generally accurate, but the response may contain minor computational or procedural flaws that do not detract from evidence of full understanding.
2	The response shows a satisfactory understanding of the essential mathematics applicable to the task, but reasoning may not be completely clear, and there may be minor flaws in computation and/or use of procedures as a result of carelessness or non-essential misunderstandings. The flaws do not detract from evidence of satisfactory understanding. A score of 2 may also be earned if the response is partially correct but some aspect of the task is omitted.
1	The response indicates limited understanding of the essential mathematics applicable to the task. While an effort is made to address the task, omissions and/or errors related to insufficient mathematical knowledge or incorrect application of skills or procedures bring into question that student's ability to deal successfully with tasks of this type.
0	The response indicates no understanding of the essential mathematics applicable to the task, or there is no response.

12)

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